controlled transmission and providing information relevant to the control of the transmitting station's power is referred to as the "receiving station" (second station). This terminology does not imply that the transmitting station cannot receive, nor does it imply that the receiving station cannot transmit.

Rather than measuring the power, the basic principle is to have the receiving station **22** simply demodulate the data and communicate this data back to the transmitting station **20**, over the link operating in the other direction. It is assumed that the opposite direction link can be made more effectively, i.e., with lower errors, than the power controlled direction.

In the transmitting station **20**, the bit which was transmitted is compared against the bit reflected back from the receiving station in order to identify those bits which were received in error at the receiving station. Whenever an error is detected, the transmitted power is increased by an amount U dB. Whenever an error is not detected, the transmitted power is decreased by an amount D dB.

In the steady state, the medium term average transmitted power is constant. Consider an interval of time consisting of N signalling bits. Suppose the bit error rate was B. Then, the average number of up-steps over internal N is N·B and the total power rise associated with the errors was U·N·B. This must have been cancelled by an equal power reduction. The power reduction is also given by

$$N \cdot D\ (1-B)$$

because N(1–B) is the average number of steps in which there were no errors, Thus:

$$N \cdot D\ (1-B) = U \cdot N \cdot B.$$

Solving for B, we find that

$$\frac{U}{U+D}$$

Thus, we can control the bit error rate directly simply by setting the ratio of U to D.

The optimum step size, U, is a function of the fading rate of the path. For slowly fading paths, U—and therefore D—should be made quite small. For rapidly fading paths, U should be made larger. The step size could be adapted according to measurements of the statistics of bit errors in the transmitting station.

For some systems, this "reflecting back" of data also permits a further advantage. For a low bit rate link, it is usually not possible to achieve coherent demodulation because of the phase ambiguity which can arise in any decision direction derivation of a carrier reference. However, if the data is reflected back. Then the transmitting end can detect a burst of errors (as that the carrier references has become inverted. In this case, the transmitting end simply inverts its transmission in order to compensate for the receiver inversion of data "at source."

The apparatus shown in FIG. **2** operates as follows. The transmitting station **2***a* modulates the data from the data source **24** via the modulation circuit **28** onto the transmitter at the current power level via a combiner/splitter and antenna **20***a*. This is received at the receiving station, modulated back onto its transmitter and sent back to the receiver in the transmitting station **22** by way of the transmitter amplifier **44** and combiner/splitter and antenna **22***a*. The two directions of communications would generally be differentiated by frequency; however, because of the delay

around the modulation, propagation and demodulation paths in both directions, the data source is buffered by buffer store **26** before comparison against the reflected data. The exclusive OR gate **30** performs the comparison. If the bits are equal, its output will be low (o), and the accumulator **36** input will be fed with "-Down Step." If the bits are different, indicating an error, then the output will be high (1), and the accumulator input will be fed with "+Up Step." The output of the accumulator controls the power of the transmitter **38** in a logarithmic fashion.

It should be understood that various changes and modifications to the presently preferred embodiments described herein will be apparent to those skilled in the art. Such changes and modifications may be made without departing from the spirit and scope of the present invention and without diminishing its attendant advantages. It is, therefore, intended that such changes and modifications be covered by the appended claims.

I claim:

1. A power controller apparatus for use in a mobile radio system comprising:

first and second stations, said first station transmitting data to and receiving data from said second station and said second station receiving data from and transmitting data to said first station;

said first station comprising:

a data source;

a means connected to said data source for modulating data to be emitted by said data source;

a means for transmitting data emitted by said data source, having a transmitting power; and

a control means for controlling said transmitting power of the transmitting means dependent on data which is transmitted from said first station to said second station, and retransmitted back to said first station, said control means comprising a comparison means having a first input which receives the data from said data source and a second input connected to the data retransmitted from said second station, and wherein said comparison means generates an output signal for controlling a switching means which is arranged to provide an input signal to an accumulator, the accumulator having an output which is connected to a means for adjusting the transmission power of the first station.

2. The apparatus of claim **1** wherein the comparison means is an exclusive OR gate performing a comparison of the first and second inputs, and if the input bits at the first and second inputs are equal, then the output will be low and the accumulator will be fed with a down-step signal, and if the input bits are different, the output of the OR gate will be high and the accumulator input will be fed with an up-step signal.

3. The apparatus of claim **1** wherein the second station further comprises a means for receiving data, means for modulating the received data, and means for transmitting the modulated data back to the first station.

4. The apparatus of claim **1** wherein the first station is arranged to detect a burst of errors in data reflected back from said second station, and wherein detection of the burst of errors indicates that a carrier reference has become inverted and said first station further comprises a means inverting the data if it is transmitting to compensate for the burst of errors.

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